CHAPTER 20

SPECIES MANAGEMENT

MUSKELLUNGE MANAGEMENT

Background

Designated as the state fish in 1955, Muskellunge are found in lakes of all sizes and in the slower waters of large rivers, usually occupying areas with abundant submerged aquatic plants. The heart of the range is north central Wisconsin, although they are found throughout the state; nearly 90% of muskellunge waters occur in the North District. Muskellunge are the largest predatory game fish found in Wisconsin. They are known to feed on virtually every fish species, as well as aquatic birds and mammals. Muskellunge are usually present at low densities, with most waters generally containing well less than 1 adult per acre. Long hours are typically required to catch a muskellunge.

Muskellunge are managed as a trophy fish species in Wisconsin, which means restricting harvest through relatively high length limits and low daily bag limits to promote the occurrence of large fish in the population. Only hook and line fishing is allowed for muskellunge. Restrictions on trolling (originally developed to reduce muskellunge harvest) also exist in many waters throughout the state. Fishing regulations for muskellunge are varied, depending upon the growth potential of the population and public support for high length limits. The current statewide minimum length limit is 40”, with a daily bag limit of 1, which applies to approximately 94% of all muskellunge waters (see Fishing Regulations, below, for a more detailed breakdown of length limits). The daily bag limit for muskellunge is 1 on all waters statewide, except Yellowstone Lake, Lafayette County (daily bag limit is 0), and Escanaba Lake, Vilas County (no daily bag limit). The open season for muskellunge north of US Hwy. 10 (Northern Zone) is from the Saturday nearest Memorial Day to November 30, except on Escanaba Lake, Vilas County, which has a continuous open season with no size limit or daily bag limit. The open season south of US Hwy. 10 (Southern Zone) is from the first Saturday in May to December 31. A variety of fish refuges designed to protect vulnerable concentrations of spawning muskellunge exist throughout the state. Natural reproduction has always been relatively low and has been presumed to be declining, making stocking an important management strategy in some waters, especially for populations that are totally dependent on continued stocking.

The economic impact of muskellunge fishing in Wisconsin is substantial. A 2006 US Fish and Wildlife Service report estimated that 1.4 million anglers fishing in Wisconsin spent $1.7 billion on fishing (fishing trips, equipment, etc.). About 25% of anglers fish for muskellunge. So, about 5.3 million angler-days are spent fishing for muskellunge each year. A rough estimate of expenditures would be $425 million spent directly on muskellunge fishing in Wisconsin. This does not include indirect economic impacts, such as wages and tax revenue.

Resource Base - Muskellunge occur in 660 lakes (588,753 acres) and 99 river segments on 49 rivers (2,085 miles; Simonson 2012). Not all waters containing muskellunge are necessarily classified as "musky waters". Muskellunge waters are divided into 3 classes of angling quality, based on the relative abundance and size-structure of the muskellunge population (see CLASSIFICATION, below):

Class A waters are the premiere muskellunge waters, considered by most to provide the best muskellunge fishing. These are divided into two distinct classes:

> **Class A1** - These waters are best known as "trophy waters" for their ability to consistently produce a number of large muskellunge, but overall numbers of muskellunge may be relatively low. Angling action can be inconsistent in these waters, but fish that are caught have a larger average size. At certain times when conditions are right, however, these waters can also provide good action (121 lakes, 253,638 acres; 11 river segments, 155 miles).

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Class A2 - These waters are best known for providing the most consistent angling action, and some have the potential to produce big fish, as well. They generally have the best overall numbers of muskellunge, but big fish make up a small percentage of the total, compared to the Class A1 waters (185 lakes, 67,354 acres; 13 river segments, 220 miles).

Class B - This intermediate class consists of waters providing good fishing. In general, angler success and catch rates may be somewhat less than in prime Class A waters (224 lakes, 64,030 acres; 43 river segments, 1071 miles).

Class C - These waters have muskellunge present, but they are not of major importance in the total fishery (130 lakes, 203,731 acres; 32 river segments, 639 miles).

Muskellunge waters are further divided into four categories that described the reproductive status of the population, based on the level of natural production and the extent to which muskellunge are stocked. This categorization is important to when considering management options for waters. Obviously, having all waters self-sustained by natural reproduction would be ideal, but stocking is often required to either supplement natural populations or to sustain a fishery. Categories of reproductive status are as follows:

Category 1 - The population is self-sustained through natural reproduction. No stocking occurs.

Category 2 - The population has some natural reproduction, however some stocking occurs to supplement natural recruitment.

Category 3 - The population has no known natural reproduction of muskellunge. Stocking of muskellunge is required for maintenance of a population.

Category 0 – The population has no known natural reproduction or stocking. Muskellunge are present, due primarily to immigration from connected waters.

<u>Management Goals</u>

I. Protect and enhance Wisconsin's naturally reproducing (category 1) populations.

A. Identify self-sustained muskellunge populations. 1. Develop an index of natural reproduction. 2. Develop quantitative criteria to define "self-sustained" populations.
B. Identify and protect existing spawning and nursery habitat. 1. Develop a volunteer monitoring program for spawning habitat delineation within category 1 and 2 lakes.
C. Protect the genetic integrity of self-sustained muskellunge populations.
D. Protect adult muskellunge from harvest to full maturity.

II. Manage muskellunge for a variety of unique fishing opportunities (including trophy, quality action, and harvest) within balanced aquatic communities.

A. Trophy Fisheries - Manage Class A1 waters to increase the catch of 50" and larger muskellunge.
B. Action Fisheries - Manage Class A2 waters for a catch rate of 1 muskellunge (any size) per 25 hours of direct angling effort.
C. Harvest-oriented Fisheries - Maintain a limited number of high density, slow-growing Class A2 populations as unique harvest opportunities.
D. Improve Existing Fisheries - Rehabilitate former muskellunge waters that have experienced substantial declines in the muskellunge population; improve class B and C fisheries, particularly in southern Wisconsin.

III. Improve the information available for muskellunge populations and educational efforts to inform anglers about the status and management of muskellunge fisheries.

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A. Monitoring - Conduct long-term trend sampling to track muskellunge abundance, size-structure and relative abundance of the associated fish community. Conduct mail surveys every 10 years to track angler attitudes and to evaluate program goals. Pilot an Angler Diary program for possible broad-scale coverage. Update Category and Class designations.
B. Evaluation – Evaluate the muskellunge stocking framework to determine relative contribution of stocked fish in Category 2 waters and stocking success in category 3 waters.
C. Education - Continue to focus on the value of catch and release to the fishery. Provide technical assistance to our partners. Emphasize that muskellunge are components of aquatic ecosystems, and as such, interact with other species via predation and competition. Evaluate the reliability and adequacy of existing information from the fishery.

IV. Minimize User conflicts - provide a unique, aesthetically pleasing experience.

Management Practices

A number of management practices are available to assist with reaching the goals of muskellunge management, including habitat protection and improvement, fishing regulations, stocking, monitoring, and education.

Habitat Protection and improvement – Good water quality and appropriate physical habitat are essential to the long-term viability of muskellunge in Wisconsin. Significant muskellunge spawning grounds should be documented and inventoried to ensure proper protection. Then, we must continue to make careful, informed decisions regarding shoreline development, aquatic plant management, chapter 30…... Adequate zoning ordinances to protect critical areas must be encouraged and properly administered. Purchase of lands adjacent to spawning grounds or other critical habitat features (e.g., nursery areas) may be warranted.

Water levels that encourage natural spawning should be promoted. Lowering water levels in fall and winter to desiccate spawning areas may promote increased egg survival. Exposing these sediments to air will reduce biological oxygen demand and increase oxygen concentrations at the sediment-water interface. Also, water levels over spawning areas must be sufficient during the spawning period.

Very little is known about improving habitat for muskellunge. Several potential practices are available but are in need of thorough evaluation.

Harvest Regulations – Generally, regulations are designed to promote the trophy aspect of muskellunge fishing. This requires that the fish be large and relatively rare. Length limits should be large enough to promote the trophy character of the species and take full advantage of its growth potential. While harvest of muskellunge is very limited, but even modest exploitation can impact the size-structure of populations. Therefore, in order to sustain the number of large fish, the exploitation on all sizes must be low.

The growth potential of muskellunge populations varies from water to water. Lake size (acres) explains nearly 70% of the variation seen among lakes in ultimate length. The statewide 40” minimum length limit matches the growth potential of the vast majority of Wisconsin waters.

A modest number of lakes with excellent growth potential should be more intensively managed for true trophy fishing opportunities. These are generally our largest lakes – the predicted average “ultimate length” exceeds 50” on lakes 2000 acres and larger. Target values for these waters are: $PSD_{38} \geq 30$; $PSD_{42} \geq 17$; density < 0.3/acre; Linf $\geq$ 48”; Omega > 8”/year.

There are certain other lakes that have naturally high densities of muskellunge and relatively poor growth potential. These lakes may be regulated using relatively liberal angling restrictions (28” minimum length limit); they are unlikely to provide trophy angling, but are often important “action” waters. These are generally self-sustained, high-density, slow-growing Class A2 populations; adults generally do not exceed 38” (in some cases, few fish exceed 30”); the inability to produce 40”+ fish is generally related to lake characteristics (e.g., small, shallow, weedy lakes, usually < 300 acres) or genetic predisposition to small

body size, not fishing pressure or harvest. Density > 0.6/acre (75th percentile); mean length at age 6 < 30" (lower 20th percentile); or PSD_{38} < 5 (10th percentile); PSD_{40} or PSD_{42} = 0.

Framework for muskellunge length limits on Wisconsin's 660 muskellunge lakes.

Musky Population Status	Minimum length limit	Number of waters	Approximate % of Musky waters
High density, slow growing populations, few fish exceed 30"	28"	21*	3%
Moderate density, moderate growth potential; most fish capable of exceeding 40"	40"	620	94%
Trophy potential, based on growth and/or historic information; Brood stock lakes	45 or 50"	20**	3%

*This includes Escanaba Lake, Vilas County, which has no minimum length limit. **This number includes waters with a 45" minimum length limit (7 waters), a 50" minimum length limit (12 waters), and Catch-and-release only (1 water).

Stocking – Stocking is a key element in the management of many muskellunge waters. Stocking is generally used as part of an integrated approach, which also considers habitat protection, restoration or improvement, harvest regulations, public access, and public education and involvement.

At present, approximately 178 waters (25% of Wisconsin's 709 muskellunge waters) are regularly stocked with muskellunge to supplement or maintain the fishery. From 2000 to 2009, an average of 53,326 large fingerlings was stocked every year in inland waters.

Stocking should be used accomplish specific objectives for the waterbody through one of the following strategies (see Chapter 60 STOCKING, for definitions and procedures):

REHABILITATION (Priority 1): Re-establishment of populations reduced by catastrophic natural or intentional sources of mortality. Waters – Winter-kill lakes should only be stocked if serious mortality occurs less frequently than once every 15 years, unless a plan to minimize the risk of future winter-kills is developed and approved. Brood Stock lakes are considered under this priority in years when eggs are taken from that lake. The stocking rate (quota) is determined by the biologist; may use large fingerlings.

Size of Fish – Fry the first year, followed by large fingerlings (> 7") or adult transfers in subsequent years.
Source of fish – Basin stock.
Stocking rate – Fry – 500/acre; large fingerlings up to 2/acre. If production is unable to meet all quota requests, a maximum of 100,000 fry or 2,500 large fingerlings will be stocked per water.
Frequency – Fry the first year, then large fingerlings annually for 4 years.
Evaluation - If natural reproduction is not reestablished after 10 years from the onset of stocking, discontinue stocking until action is taken to identify and correct the reason(s) for the poor natural recruitment.

RESEARCH or EVALUATION (Priority 2): Experimental stocking done in conjunction with a research or evaluation project. Stocking sizes and frequencies as needed to realistically meet the objectives of the evaluation project, approved and funded through the normal FM workplanning process (or Science Services process).

REMEDIATION OR RECREATION (MAINTENANCE) (Priority 3): Waters - Based on evidence provided by Fields et al. (1997), stocking should not occur in waters with adequate natural reproduction, in order to minimize the potential negative impact of stocked fish on naturally reproducing populations in the receiving or connected waters (Goal I. C). An average fall electrofishing catch rate of at least 0.5

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YOY/mile is normal for muskellunge in naturally reproducing waters (and ranges from 0.1-1/mile). Further, no stocking quotas should be developed for Class A2 lakes less than 200 acres in size or for Class A1, B, or C lakes less than 500 acres in size. Either small or large fingerlings should be used, based on the abundance of existing predators. Source of fish should be specified as the appropriate basin stock, unless the water is outside the native range of muskellunge. Generally, fingerlings should be stocked in alternate years. If the fishery objective (e.g., adult density, catch rate, etc.) is not met after 10 years from the onset of stocking, discontinue stocking until action is taken to identify and correct the reason(s) for poor survival.

Size of Fish – Large fingerlings (> 7").
Source of fish – Basin stock.
Stocking rate – Up to 2/acre. If production is unable to meet all quota requests, a maximum of 2,500 large fingerlings will be stocked per water.
Frequency – Annually or in alternate years.
Evaluation - If the fishery objective (adult density, catch rate, etc.) is not met after 10 years, discontinue stocking until action is taken to identify the reason(s) for poor survival.

INTRODUCTIONS (Priority 4): Waters - New introductions of muskellunge are not authorized without an Environmental Analysis. Even then, limited availability of fingerlings from the hatchery system severely limits the ability to add new muskellunge waters that will require ongoing maintenance stocking. Only large waters (>3,000 acres) with the potential for good growth should be considered.

Muskellunge Basin Stocks available:

Basin Stock name:	Suitable for the following inland waters:	Suitable for the following outlying waters:
Upper Chippewa River	Chippewa R., St. Croix, L. Superior inland waters, Black River; Universal Receptors*	N/A
Great Lakes Spotted^	Lake Winnebago System and down stream via the Fox River to De Pere dam; Inland Brood Stock Lakes	Green Bay, Lower Fox River, Lake Michigan and Lake Superior
Upper Wisconsin River	Wisconsin River and L. Michigan inland basins; Universal Receptors*	N/A

* "Universal Receptors" are waters outside the native range of muskellunge that are dependent on stocking.
^ The Fisheries Management Board will examine where Great Lakes Spotted Muskellunge may be stocked.

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Existing stocking practices under the Remediation and Recreation strategies, by far the most common strategies, are presented in the following table, along with the number of waters stocked within each strategy.

Stocking framework for large fingerling muskellunge under the Remediation and Recreation strategies (priority 3). Six (6) waters under the Rehabilitation and Research strategies are not included. Stocking was terminated in 28 randomly selected remediation waters (*), beginning in 2001. These waters are not included in the totals.

	Nominal stocking rate (number/acre)				
Strategy	0	0.5	1	2	Total
Remediation	28*	45	37	9	91
Recreation	0	28	35	18	81
Total	0*	73	72	27	172

SPECIAL CONSIDERATIONS

1) All waters are typically “capped” at a maximum of 2,500 large fingerlings per year, even if the full quota requested exceeds this value, in order to spread out available production across many waters. This includes Brood Stock lakes.

2) However, complete stocking requests should be submitted, up to the full “biological quota” (selected stocking rate*lake acres) regardless of the cap, even if the propagation system may not be able to meet the need, or the request is for a product that is not yet approved (e.g., yearlings). The full quota will be used to fill requests above the 2,500 fish cap in the event of surplus fish and it will be used to determine the number of cooperatively reared or club-purchased fish that may be stocked above the cap; coop fish are stocked above the “cap”, up to the full biological quota. This also provides an accurate, measurable demand from the hatcheries for new and existing products and assists with long-term infrastructure planning. Further, every effort will be made to evaluate requests for more of any existing products and the demand for new products. If possible, the production system will attempt to produce all of the requested fish, either via our hatchery system, with cooperative agreements, or from other State, Federal, Tribal agencies. We also provide lists of unmet or deferred needs to private aquaculture.

3) If surplus fish are available, a “tier system” will be applied. Under the first tier, all waters will receive requested quotas (up to a maximum of 2,500). Then, under the second tier, any waters capped at 2,500 under the first tier will receive fish up to the full “biological” quota (or, a maximum of 5,000, total). Finally, any waters capped at 5,000 under the first and second tiers will receive any additional fish, up to the full “biological” quota (or a maximum of 7,500, total) under the third tier.

4) From 2003-2012, muskellunge stocking quotas in North District waters should not change, in order to evaluate the contribution of stocked muskellunge. This long-term stocking plan for the NAD was, however, intended to be an adaptive process, and quotas may be changed IF good information is available to justify it. Waters in other Regions need not follow this protocol. However, it is desirable to establish and maintain consistent, long-term quotas for all waters whenever possible.

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5) NO STOCKING QUOTAS should be submitted for current or potential Brood Stock lakes (except in years when that lake is used as a brood source, if needed):

Upper Chippewa River Basin – Chippewa Flowage, Lost Land and Teal Lakes, Lac Courte Oreilles, Sawyer County.

Upper Wisconsin River Basin - Big and Little Arbor Vitae Lakes, Vilas County; Minocqua Chain, Oneida County; Pelican Lake, Oneida County; Rhinelander Chain, Oneida County; Squirrel Lake, Vilas County

6) Muskellunge stocking quotas should not be developed for Class A2 waters less than 200 acres. For Class A1 waters, a minimum lake size of 500 acres is recommended. These guidelines currently DO NOT retroactively remove quotas from waters. However, quota requests should be critically reviewed based on muskellunge density, fishing effort/public use, and distance from the hatchery; please consider removing smaller waters from the stocking plan, where appropriate.

Information and Education – Although much is known about muskellunge, additional information is needed to fully realize the management goals.

Data on the catch, harvest and effort directed at muskellunge is currently being obtained the in heart of the range, but much less information is available from stocked waters in the southern half of the state. Additional creels surveys should be conducted on important southern waters. We have accumulated considerable information on the relative abundance and size-structure of many muskellunge populations. A long term evaluation of stocking is underway and should be completed soon.

There is a need for better information on age and growth of muskellunge, as well as recruitment in stocked and NR fisheries, spawning behavior (site fidelity) relative to brood stock objectives, and an evaluation of methods for conducting population estimates. Support for the propagation program related to brood stock management and an evaluation of our stocking framework are also priorities. A program that involves volunteer anglers in both angler catch rates and age and growth (using PIT tags) should be pursued. Ideas for further research, listed in order of priority, are:

a. Catch and release mortality: live bait (quick-set) versus artificial, etc.
b. Species interactions.
c. Spawning habitat – can we improve it?
d. Do female muskies spawn every year? Implications for population estimate methods and brood stock management.
e. Fry/small fingerling stocking successes (where, when, how) in light of continuing difficulties with forage for large fingerling rearing.
e. Systematic evaluation of stocking practices to increase returns.
f. Evaluate traditional natural reproduction lakes to determine reasons for reductions in recruitment.
g. Fall young-of-year sampling methods development – catchability, etc.
h. Evaluate Lake Superior – St. Louis River populations – evaluate other locations to reestablish populations in Lake Superior.
i. Develop a brood stock genetics database.
j. Radio telemetry on Green Bay – fixed station acoustics?

Monitoring – In addition to the standard sampling procedures (CHAPTER 10), there are specific procedures for estimating adult muskellunge abundance, which also includes estimating three other parameters: length-frequency histograms (PSD), relative weight (Wr), and growth.

Adult muskellunge are captured in two consecutive years (Hanson 1986) using standard fyke nets during the spring spawning period (SN II). Electrofishing may be used to supplement the capture of muskellunge for population estimates, but fish sampled by electrofishing should not be included in length-frequency histograms. If SN 1 is being conducted for other species, you should also mark muskellunge during this

period (and include them in length-frequencies). Attempt to mark 10% of the estimated population or 1 fish per 10 surface acres.

Muskellunge are measured, weighed, and marked with a half pelvic or pectoral fin-clip (other marks/tags may be used if adjustments are made for tag loss). Weights should be taken on as many muskellunge as feasible, as time permits. During the marking period, muskellunge < 30 inch are given a different clip to aid in adjusting for recruitment of fish that grow into the 30”+ range during the recapture period. Attempt to determine sex; fish that cannot be classified (unknowns) are considered mature if they are as long as the smallest sexually mature female for that water, or 30 inches or longer.

Muskellunge captured during the first year make up the marking run, and those from the second year make up the recapture sample. Numbers in the recapture sample are adjusted for recruitment over the 1-year period using sex-specific and lake-specific growth rates, based on marked fish < 30”. [For populations with a considerable portion of adult fish smaller than 30 inches, the number of muskellunge 30 inches or longer is determined by multiplying the proportion of muskellunge 30 inches or longer handled in the marking sample times the abundance estimate for mature fish 20 inches or longer].

Abundance of adult muskellunge ($\geq$ 30 inches) is estimated using Bailey’s modification of the Petersen single-census method (Hanson 1986):

$$N = M(C+1)/(R+1);$$

where N = population estimate; M = the number of fish marked in the first sample; C = the total number of fish (marked and unmarked) captured in the second (recapture) sample; and R is the number of marked fish captured in the second sample.

For more information on adult muskellunge sampling protocol, see Cornelius and Margenau (1999) and Margenau and AveLallemant (2000).

Classification - Muskellunge water classifications and categories should be reviewed and updated, if needed, as a result of each survey. The following guidelines will help determine the appropriate class and category of most waters.

1. Class "A1" waters are trophy waters managed for exceptional population size-structure. Class A1 should not generally be used for waters less than about 1,000 acres. Instead, smaller waters managed for low to moderate density and good size-structure are more appropriately Class "B" waters.

2. Class C waters are waters where muskies are present, but no real fishery exists and no plans exist to improve the population. Class "C" that have been dependent on stocking and where the status has not changed for approximately 10 years could be dropped from the Muskellunge waters listing. Class “C” should rarely be a management goal for musky waters. It is reserved largely for waters connected to other waters with muskellunge present.

3. Classifications should generally be consistent among lakes within a chain.

4. Reproductive category should be based on actual stocking records.

5. Category 1, self-sustained, generally means that fall YOY catch rates average at least 0.24/mile (normal range: 0.0 – 0.53/mile); that several sizes/ages of fish are present when no stocking occurs; and the population abundance falls within an acceptable range in the absence of stocking (0.14 – 0.52/acre).

6. Waters that haven’t been stocked for several years should either be category “1” or category “0”.

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7. Category "0" should generally be reserved for waters with NO reproduction and NO stocking, but with some muskellunge present via connection to other stocked or NR waters; do not use category 0 for “unknown”.

Standard Sampling Procedures, by water types.

Sampling methods are selective for certain species and sizes. Using the appropriate method is important to maximize the information collected and provide comparable results across waters. The table below describes the standard sampling methods recommended for each important fish species or group of species in Wisconsin.

Waters	Metrics	Period	Temp. Range	Gear	Procedures
Lakes	CPE, PSD, PE	Early Spring Netting (I) – ONLY if also walleye netting	Ice out to 40-50 F	4’x6’, ¾” bar mesh	length/weight/ sex/age; mark/recapture
Lakes	CPE, PSD, PE	Late Spring Netting (II)	50 - 55 F	4’x6’, ¾” bar mesh	length/weight/ sex/age; mark/recapture
Lakes	Juvenile CPE, age (NR or potential NR lakes)	Fall Electrofishing	50 - 65 F	Boom shocker, 3/8” mesh dip nets	length/weight/ age all muskellunge < 20”
Non-wadable Rivers	CPE, PSD	Summer		Boom shocker or mini-boom	length/weight/ age

Assessment Criteria

Normal range of muskellunge CPE (number/net-night) values (2000-2011), by classification

	CPE (muskies/net-night)			
Musky Class	**First Quartile**	**Median**	**Third Quartile**	**N**
A1	**0.25**	**0.42**	**0.73**	**110**
A2	**0.38**	**0.74**	**1.50**	**156**
B	**0.15**	**0.32**	**0.64**	**121**
C	**0.05**	**0.12**	**0.35**	**62**
Overall	**0.19**	**0.41**	**0.87**	**468**

Normal range of muskellunge abundance (number/acre) values (2000-2010), by classification

	PE (muskies/acre)			
Musky Class	**First Quartile**	**Median**	**Third Quartile**	**N**
A1	**0.09**	**0.14**	**0.22**	**32**
A2	**0.27**	**0.50**	**0.70**	**38**
B	**0.17**	**0.30**	**0.39**	**23**
Overall	**0.15**	**0.26**	**0.50**	**93**

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Normal range of juvenile muskellunge (≤ 20") CPE values (number/mile) values (2000-2011), by category

	CPE (muskies/mile)			
Musky Category	**First Quartile**	**Median**	**Third Quartile**	**N**
0	**0.00**	**0.16**	**0.71**	**15**
1	**0.00**	**0.24**	**0.53**	**117**
2	**0.13**	**0.44**	**0.89**	**263**
3	**0.00**	**0.37**	**1.00**	**175**
Overall	**0.00**	**0.36**	**0.83**	**570**

Normal range of juvenile muskellunge (≤ 20") CPE values (number/mile) values (2000-2011), by classification

	CPE (muskies/mile)			
Musky Class	**First Quartile**	**Median**	**Third Quartile**	**N**
A1	**0.12**	**0.27**	**0.88**	**135**
A2	**0.21**	**0.49**	**1.00**	**210**
B	**0.00**	**0.37**	**0.79**	**149**
C	**0.00**	**0.17**	**0.50**	**76**
Overall	**0.00**	**0.36**	**0.83**	**570**

Normal ranges of muskellunge PSD values (2000-2011), by classification

	$PSD_{38/30}$			
Musky Class	**First Quartile**	**Median**	**Third Quartile**	**N**
A1	**23**	**38**	**54**	**96**
A2	**17**	**29**	**41**	**108**
B	**27**	**38**	**50**	**59**
C	**13**	**46**	**60**	**19**
Overall	**21**	**33**	**50**	**282**
	$PSD_{42/30}$			
A1	**5**	**13**	**23**	**96**
A2	**2**	**7**	**14**	**108**
B	**4**	**11**	**18**	**59**
C	**0**	**13**	**25**	**19**
Overall	**3**	**9**	**18**	**282**

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